

The Future of Green Hydrogen



HYDROGEN



TRANSPORTATION
FUEL



CIRCULAR



SUSTAINABLE
ENERGY



INDUSTRIAL
GREEN



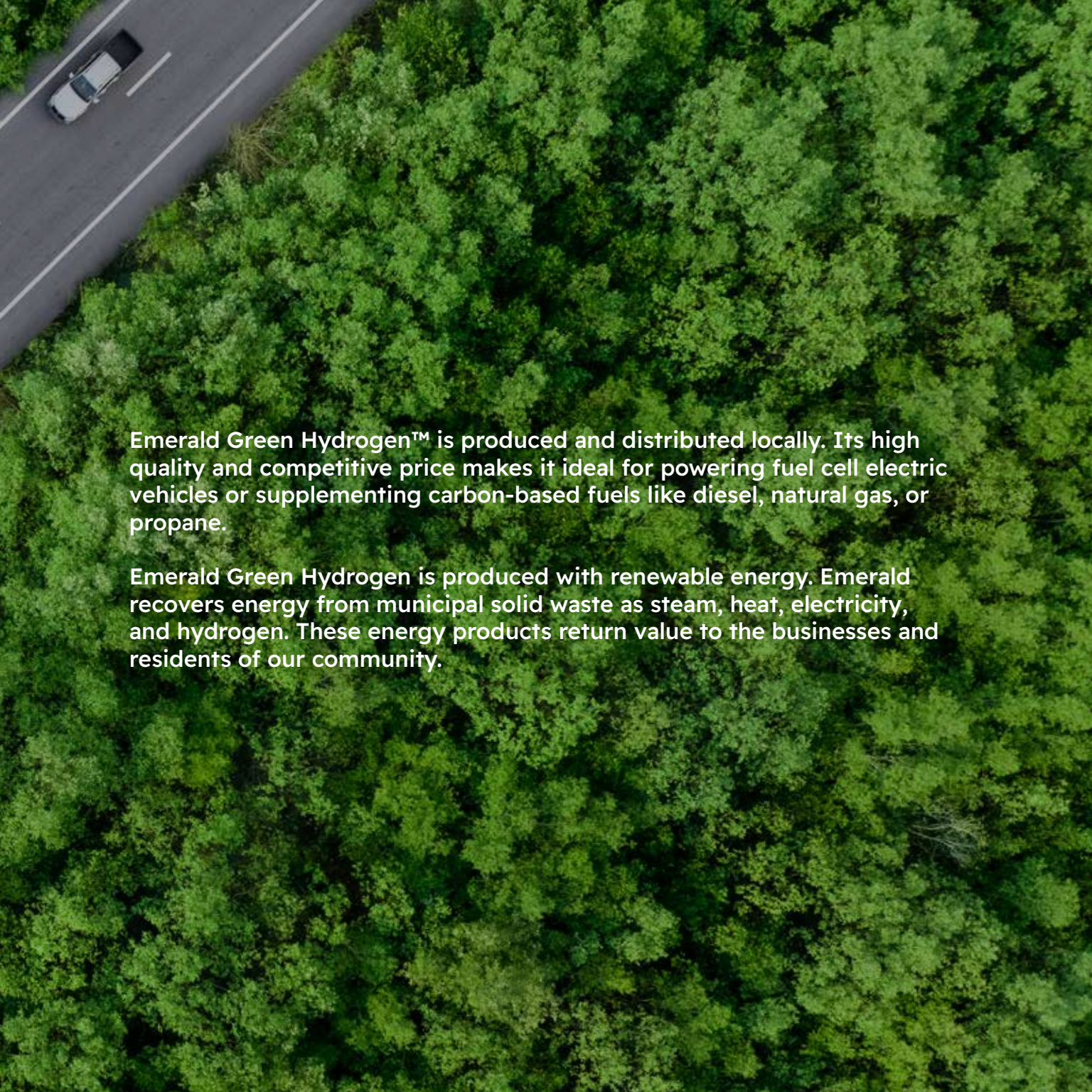
LOW
CARBON

An aerial photograph of a two-lane asphalt road cutting through a dense, lush green forest. A white car is driving in the left lane, and a large red semi-truck is driving in the right lane. The text is overlaid on the left side of the image.

Emerald Green Energy A Clean Energy Source

Hydrogen is an emission-free fuel. When used, hydrogen releases only water – it does not release any carbon or nitrogen contaminants. Whether used in electric cars, buses, trucks, or trains or used to supplement diesel or natural gas, hydrogen can help “de-carbonize” our energy system and substantially enhance urban air quality.

The critical factor to successfully advance the hydrogen economy is establishing an efficient system for generating and distributing hydrogen at a price that can compete with carbon-based fuels. Producing and distributing hydrogen locally lowers capital and distribution costs, enabling it to be offered at a price that is competitive with gasoline, diesel, and natural gas.

An aerial photograph showing a paved road with a white car in the upper left corner, transitioning into a vast, dense green forest that fills the rest of the frame. The text is overlaid on the forest area.

Emerald Green Hydrogen™ is produced and distributed locally. Its high quality and competitive price makes it ideal for powering fuel cell electric vehicles or supplementing carbon-based fuels like diesel, natural gas, or propane.


Emerald Green Hydrogen is produced with renewable energy. Emerald recovers energy from municipal solid waste as steam, heat, electricity, and hydrogen. These energy products return value to the businesses and residents of our community.

Revolutionizing Transportation

Commercially accessible hydrogen can help de-carbonize the transportation sector, improving its sustainability and significantly reducing pollutants and greenhouse gas emissions from buses, trucks, trains and automobiles. As hydrogen fuel use grows, emissions of nitrogen oxides, volatile carbon compounds, fine particulate matter, and greenhouse gases will diminish, enhancing urban air quality.

Hydrogen is a viable option today for zero-emission electric vehicles. Fuel cell buses, trucks, trains and cars are fully developed and commercially available.

Additionally, hydrogen can be used to supplement carbon-based fuels, creating hybrid fuels that are more efficient and produce fewer emissions. The use of hybrid fuels in existing vehicles can be a bridge between existing fleets and future hydrogen-powered fleets.

A blue bus is shown from a side-rear perspective, parked on a city street. A hydrogen fueling station nozzle is attached to the side of the bus. The nozzle is black with a yellow hose. The bus has a black door and a black window. The background shows a city street with trees and people walking. The text is overlaid on the bus.

Emerald Green Hydrogen can facilitate the transition into the hydrogen economy by offering a locally sourced, competitively priced hydrogen supply. A dependable source of hydrogen will promote the adoption of hybrid fuels and contribute to the expansion of new hydrogen-powered vehicles.

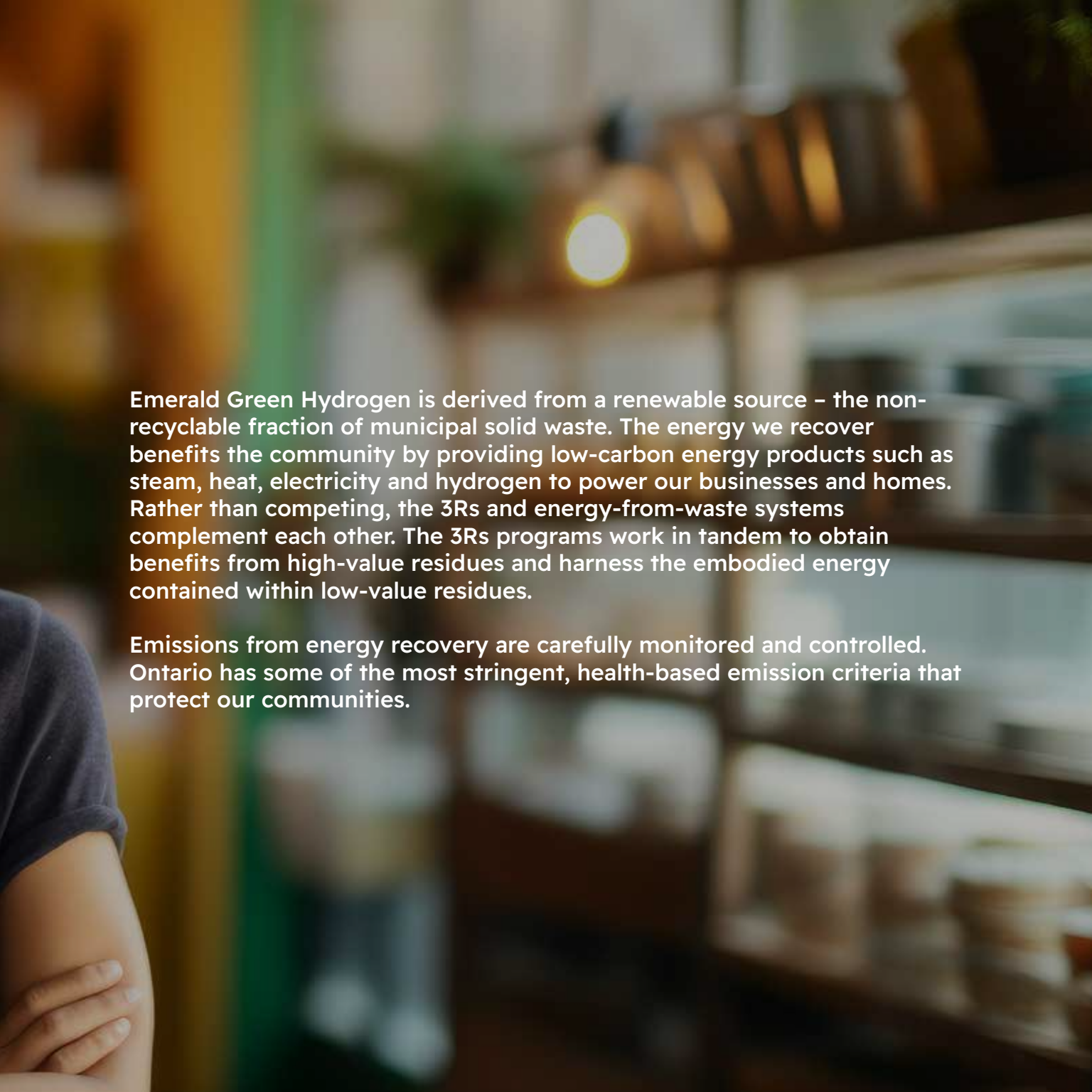
Emerald Green Hydrogen is local. It is produced within the Greater Toronto Area and available for distribution to area businesses.

Emerald Green Hydrogen is produced with renewable fuel. Its price is not linked to fossil fuels, making it stable and competitive with carbon-based fuels.

A woman with dark hair, wearing a green apron over a dark t-shirt, is smiling warmly at the camera. She has her arms crossed. The background is a blurred indoor setting, possibly a kitchen or workshop, with warm lighting.

Environmentally Friendly

Sustainable communities have a structured approach to managing their waste products, employing a hierarchy that focuses on extracting value from materials that otherwise have no worth. This hierarchy leverages economic remnants through a combination of 3Rs (Reduce, Reuse, Recycle) initiatives and energy recovery processes. By extracting value in this manner, communities maximize the economic, environmental, and social benefits from the resources and energy they consume.



Emerald Green Hydrogen is derived from a renewable source – the non-recyclable fraction of municipal solid waste. The energy we recover benefits the community by providing low-carbon energy products such as steam, heat, electricity and hydrogen to power our businesses and homes. Rather than competing, the 3Rs and energy-from-waste systems complement each other. The 3Rs programs work in tandem to obtain benefits from high-value residues and harness the embodied energy contained within low-value residues.

Emissions from energy recovery are carefully monitored and controlled. Ontario has some of the most stringent, health-based emission criteria that protect our communities.

Zero Waste Solutions

Emerald's Waste-to-Energy Endeavor

At Emerald, we are fully dedicated to diverting waste from landfills while contributing value to our community. We envision a promising future for our Energy-from-Waste (EfW) project and are in the process of formulating our expansion plan in accordance with the Environmental Assessment Act (EAA).

Our energy production not only offsets the usage of fossil fuels but also eliminates emissions associated with the transportation and disposal of waste in landfills. We are committed to ensuring our community benefits from a diverse range of energy products, including steam, electricity and exploring new avenues such as district heating and hydrogen production.

Key Highlights of Emerald's Waste-to-Energy Initiative:

- Our facility has been in operation since 1992.
- We specialize in extracting energy from non-hazardous waste.
- Our current energy production capacity stands at 10 MWe.
- We currently supply steam to a local recycled paper manufacturer and electricity to the Ontario grid.
- Our operations support 43 employees and contribute \$3 million to the local economy through various services.
- We have a 30-year track record of adhering to Ontario's stringent environmental standards.
- Ongoing redevelopment efforts are aimed at increasing energy recovery to 100 MWe, as steam, heat, electricity and hydrogen.
- We share ownership with U-Pak Disposals and are committed to sustainable waste management.





Why choose Zero Waste? The simple answer: we aim to send nothing to landfill. We reduce what we need, reuse when possible, recycle or compost what we can and recover energy from the residual.

U-Pak and Emerald's **Zero Waste Solutions** looks to redefine the system. As a society, we used to live in a linear economy where we take resources and energy from the earth and dump them into the ground when they have little or no value. Zero Waste supports the circular economy, where waste is virtually eliminated.

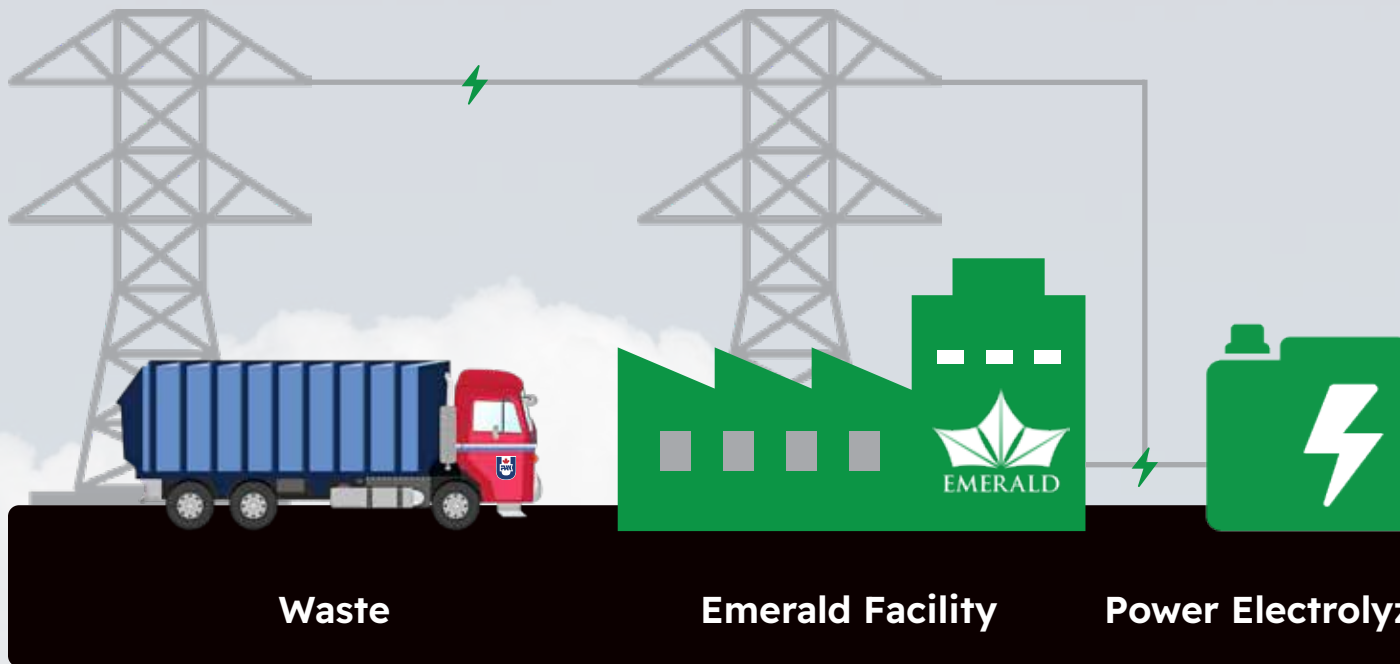
Reduce, reuse, recycle, and recover...preserving nature

Understanding Hydrogen

And its Applications

Hydrogen is the simplest element in the universe, consisting of just one proton and one electron. It is an odourless, colourless gas (H₂) that is much lighter than air. It is used in many industries, including metallurgy and food processing. One of its standout attributes is being a zero-emission fuel, producing no carbon emissions or nitrogen emissions when combusted or used as a source of electricity in fuel cells.

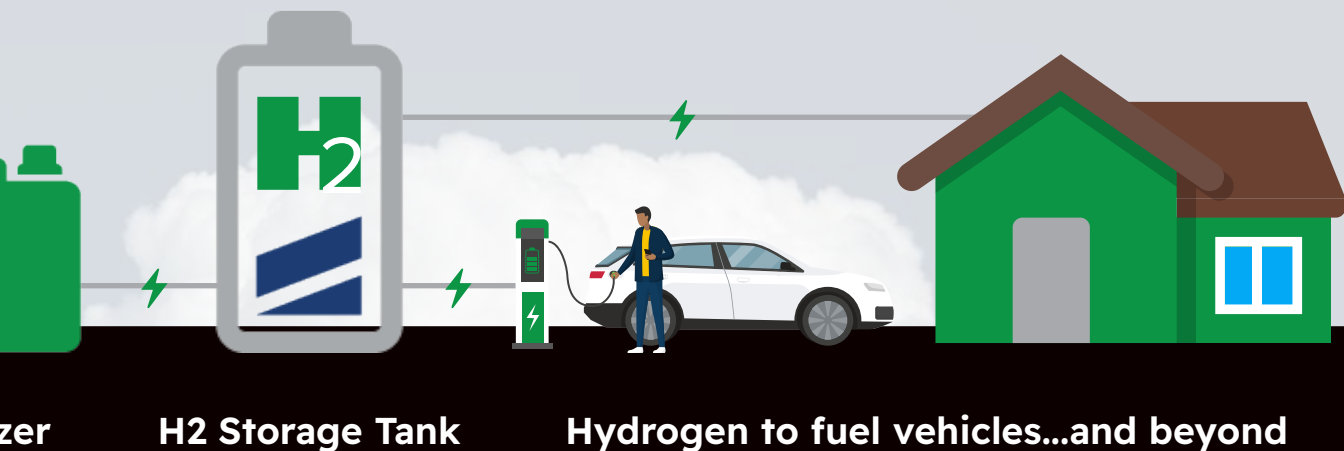
Using Energy from Waste to create Green Hydrogen



Hydrogen serves multiple roles, functioning as:

- An electron carrier, providing power to electrical devices, whether they are vehicles or stationary power equipment.
- A fuel that can be employed directly, either as a replacement for or in conjunction with diesel or natural gas engines, resulting in improved fuel efficiency and reduced emissions.
- An indirect fuel source when combined with CO₂ to generate natural gas through a process known as methanization.

1 kilogram of hydrogen gas (H₂) is equivalent to 3.79 litres of diesel or gasoline. Hydrogen outperforms natural gas in this regard, containing 2.5 times more energy for a given volume.



Why Choose Hydrogen Production?

Sustainable communities adopt a localized approach to managing their waste products

Promoting Resource Recovery



Sustainable communities seek to extract the maximum value from all residual waste, materials that can't be recycled for commercial, technical or economic reasons. Energy generated from residual waste plays a pivotal role in supporting these communities by:

- Offering a sustainable means of managing materials that can't be recycled.
- Returning energy to the community as steam, heat, electricity and now hydrogen.
- Recapturing metals from non-recyclable materials.
- Creating opportunities to re-purpose ash into alternative construction materials.

Minimizing Landfill Waste



Sustainable communities aim to minimize the volume of waste destined for landfills and its associated environmental impacts. Energy recovery plays a significant role in achieving this goal by:

- Diminishing the need for landfill disposal.
- Reducing pollutant and greenhouse gas emissions associated with waste transportation to remote landfills.
- Conserving agricultural lands and safeguarding rural communities from the impacts of landfill expansion.
- Reducing greenhouse gas emissions from landfills.

Harnessing Energy



Energy derived from waste captures the energy contained within materials that cannot be recycled for technical or economic reasons. Energy recovery can yield multiple advantages for the local community, such as:

- Supporting local industries and homes through electricity, steam or district heating.
- Diminishing the demand for energy from non-renewable sources.
- Generating hydrogen locally for use as a transportation fuel.

Empowering Communities



Energy recovery contributes to the empowerment and resilience of local communities by delivering both economic and social benefits, including:

- Fostering the creation and growth of local businesses.
- Generating employment opportunities for local families.
- Supporting the development of local services and infrastructure.



Sharing the Advantages

Energy from Waste is a multifaceted boon for society. It eases pressure on traditional energy grids, curbs carbon emissions, and fosters local employment opportunities, contributing to economic growth and innovation. Simultaneously, it reduces waste sent to landfills, alleviates environmental pollution and carbon emissions, improves air quality, and ultimately enhances the overall well-being of communities. This holistic approach to waste management delivers economic, environmental, and social benefits, making Energy Recovery a pivotal solution for a sustainable and resilient future.

Energy from Waste

Assessing the viability of a renewable energy technology for hydrogen production:

- Easing the burden on the grid.
- Mitigating carbon emissions from the waste management sector.
- Pioneering a new business model for the energy recovery.

Hydrogen Industry

Launching the hydrogen economy:

- Implementing an approach that can resolve the Supply-Demand dilemma within the Hydrogen Economy.
- Providing a consistent, competitively priced supply of high-quality hydrogen for users in the GTA.



Energy from Waste
will divert waste that
would typically be sent
to landfill.



**Emerald Green
Hydrogen** can supply
clean fuel to power
our communities.



Transportation Sector

Helping to de-carbonize the transportation sector:

- Eliminating or decreasing diesel consumption.
- Reducing contaminant emissions.
- Reducing CO2 emissions.
- Extending the operational lifespan of existing assets.

Communities

Supporting sustainable, resilient communities:

- Diverting waste from landfill disposal.
- Protecting local air quality.
- Supporting job growth in Clean Tech including:
 1. 50 full-time positions within the Energy facility.
 2. Emerging opportunities in hydrogen manufacturing, use, distribution and research and development (R&D).



WASTE HAS VALUE

Scan the QR code to find out how much your waste is worth today!



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